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ABSTRACT

The reading comprehension abilities of 21 intermediate grade children, previously diagnosed as having Attention-Deficit/Hyperactivity Disorder (ADHD), were compared to 21 carefully matched age/grade peers who did not have this disorder. The study investigated ADHD and Comparison group differences in different levels of comprehension (microprocessing and macroprocessing), in the metacognitive skill known as comprehension monitoring, and examined whether ADHD symptom severity correlated with reading comprehension ability. Results supported two of the study's four hypotheses: (1) ADHD children obtained lower reading comprehension test scores than did their carefully matched peers in the Comparison group; and (2) greater ADHD symptom severity predicted lower reading comprehension test scores. Results failed to support the hypotheses that there would be an interaction between group membership (ADHD and Comparison) and reading comprehension task (macroprocessing and microprocessing), and that the ADHD children would have relative difficulty monitoring the accuracy of their comprehension. (TS)

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The Reading Comprehension Abilities of Children with Attention-Deficit/Hyperactivity Disorder [1]

A paper presented at the annual meeting of the National Association of School Psychologists

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Research Summary

This study compared the reading comprehension abilities of 21 intermediate grade children, previously diagnosed as having Attention-Deficit/Hyperactivity Disorder (ADHD), to 21 carefully matched age/grade peers who did not have this disorder. In constructing the sample, attempts were made to exclude ADHD children who had primarily hyperactive/impulsive symptoms. The study investigated ADHD and Comparison group differences in different levels of comprehension (microprocessing and macroprocessing), in the metacognitive skill known as comprehension monitoring, and examined whether ADHD symptom severity correlated with reading comprehension ability.

To focus on the effect of ADHD on reading comprehension, variables known to affect this skill were either controlled for or measured. Results of selection and screening procedures revealed the two groups of children approached this study's reading comprehension tasks with similar word identification, word attack, and word knowledge abilities. Their background knowledge and reading speed were also very similar. Also, for all but one variable (rapid number naming), group membership (ADHD and Comparison) correlated only with the reading comprehension measures (Macroprocessing and Microprocessing). These findings increased confidence in the assumption that group differences on the measures of reading comprehension were do to the presence or absence of ADHD, and not to other variables associated with reading comprehension.

Results supported two of the study's four hypotheses. ADHD children obtained lower reading comprehension test scores than did their carefully matched peers in the Comparison group, and greater ADHD symptom severity predicted lower reading comprehension test scores. Results failed to support the hypotheses that there would be an interaction between group membership (ADHD and Comparison) and reading comprehension task (macroprocessing and microprocessing), and that the ADHD children would have relative difficulty monitoring the accuracy of their comprehension. From these findings several different theoretical issues were considered.

Theoretical Implications

Explanations for the ADHD group's relative comprehension failures included difficulties with listening comprehension, effortful processing, poor focused attention, and poor motivation.

Listening Comprehension. According to the one model of proximal causes of reading difficulty, reading comprehension is a function of both graphophonic and listening comprehension skills. Weakness in either area will result in comprehension failures. Given that children in this study all had average or above word identification and word attack skills, it might be that they had

[1] Adapted from Brock, S. E. (1995). The reading comprehension abilities of children with Attention-Deficit/Hyperactivity Disorder. Unpublished doctoral dissertation. University of California, Davis.

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poor listening comprehension skills. Future research may want to investigate the listening comprehension abilities of children with ADHD. If the reading comprehension of these children is not due to decreased listening comprehension skill, then alternative explanations for their comprehension failures will need to be evaluated.

Effortful processing. Another possible implication of this research is that the child with ADHD may have relative difficulty with tasks requiring effortful processing. In this study ADHD and Comparison group children were matched according to their ability to read single words, a task that can become automatic, and that is not limited by attentional capacity. Despite group similarities on this automatic task the groups differed significantly on the reading comprehension tests. These tests were considered to require effortful processing (i.e., they were slow, serial, and initiated intentionally). Thus, it is speculated that children with ADHD have difficulty with these tasks.

Throwing doubt on the automatic/effortful processing interpretation was the failure to find an interaction between group membership and type of reading comprehension task. From the assumption that macroprocessing was more effortful than microprocessing, it was hypothesized that there would be a greater difference between ADHD and Comparison groups on Topic and Main Idea Tests than on the Cloze Test. This could mean that the effortful/automatic processing continuum does not apply as neatly to reading performance as was originally speculated. However, the Cloze Test took approximately twice as long for both groups of children to complete than did the Topic and Main Idea Identification Tests. Thus, it may be the demands of the Test, not microprocessing, resulted in failure to find an interaction.

If sustained attention is a primary ADHD symptom, and given the assumption that effortful processing requires considerable sustained attention, it would be expected that performance on the Cloze Test would be significantly worse than Topic and Main Idea Identification Tests. That this was not the case suggests that microprocessing is less effortful than macroprocessing. Given the amount of sustained attention the Cloze Test required, if it was just as effortful as the Topic and Main Idea Tests, ADHD children should have scored significantly lower on it.

Focused Attention. Another explanation for the ADHD group's comprehension failures was that the children being studied had a focused attention deficit. Supporting this view was the rapid number naming result. The finding that ADHD children were slower at rapidly naming a series of numbers is consistent with previously developed views of attention deficits without hyperactivity. It was suggested that the difference between ADHD and Comparison group performance on this test may be a reflection of a different type of attention deficit, one of focused attention and deficient speed in cognitive processing.

The possibility that it is a deficit in focused attention, not sustained attention, that is at the heart of the ADHD group's comprehension failures is intriguing. Rather than lacking the attentional resources to remain on-task for an extended time (sustained attention), it may be that the children in this study had difficulty focusing on one type of information to the exclusion of others (focused attention).

Learned Helplessness and/or Motivation. A final explanation for the relative reading comprehension difficulties of the ADHD group participants is drawn from the apparent failure to find ADHD children to be less accurate at monitoring their own reading comprehension. Contrary to the hypothesis, results suggest children with ADHD to be relatively accurate predictors of their reading comprehension. It was speculated that a possible interpretation of this result is that children with ADHD, as a result of their frequent exposure to failure, have come to expect that they will perform poorly on academic tasks. Thus, when asked to rate their own performance they automatically assume comprehension failure. This assumption of failure may also have had an adverse influence on reading comprehension performance. In other words, their relative comprehension monitoring accuracy may have been a reflection a self-fulfilling prophecy. ADHD children may have believed that they were going to fail before they even started the reading

comprehension tests, and as a result, devoted less effort to the tests. With this mind set, it would not be surprising to find that these children not only performed poorly, but that they also negatively evaluate their performance.

This interpretation of the ADHD group's relative comprehension monitoring successes was suggested to be consistent with a pattern of behavior known as learned helplessness. The current study's comprehension monitoring results were interpreted as possibly being reflections of the ADHD child's expectation of failure and the belief that they lack the ability to succeed. Further, this learned helplessness interpretation of comprehension monitoring results may have implications for the interpretation of the reading comprehension findings. It may generate an alternative explanation for the ADHD group's relative reading comprehension difficulties. It is possible that these reading comprehension difficulties were not solely due to ADHD symptomology. While these symptoms may play a role in the comprehension failure of ADHD children, a learned helplessness attributional style may also play a role in such failure. Furthermore, there may be a reciprocal relationship between learned helplessness, comprehension failure, and ADHD symptoms.

Practical Implications

The practical implications of the research dealt with instructional, assessment, and medication issues.

Instruction. Results in support of the study's first hypothesis suggests that children with ADHD have special reading instructional needs. Simply put, when compared to children without this disorder, children with ADHD have poor reading comprehension abilities. As a result, they will be at a disadvantage when asked to read for new learning.

Results in support of the study's fourth hypothesis will help educators to further qualify their concern regarding the reading comprehension abilities of children with ADHD. Those children with more severe ADHD symptoms will have greater reading comprehension difficulties. Thus, they will have a greater need for individual and specialized reading instruction than will the child with less severe symptomology.

Given these findings, and the interpretation that ADHD adversely affects effortful processing, it is anticipated that besides reading comprehension, children with ADHD will also have relative difficulty with advanced math and written language activities. Future research might investigate this hypothesis by matching children with ADHD with peers according to basic math and written language skills (e.g., automatization of number facts, spelling test performance, etc.) and then administering tests designed to assess advanced mathematical reasoning and essay writing. Given the current results, it is expected that on these effortful processing tasks children with ADHD will perform more poorly than peers who do not have ADHD.

Assessment. Results of the current study would appear to support previous research that has suggested ADHD children perform poorer when required to read longer as opposed to shorter passages, and that ADHD children perform poorer than other children when required to read longer passages. From these results it was concluded that measures traditionally used to assess reading disabilities, which typically make use of short passages, may be insufficient in identifying reading difficulties among children who have ADHD. Encapsulated tasks may fail to identify the reading comprehension difficulties of these children. The use of longer reading passages, such as were employed in the current study, were judged to be important when assessing the reading comprehension abilities of children with ADHD.

Medication. Although not a part of the study's design, several of the ADHD group participants had taken medication to treat their symptoms on the day of testing. This fact allowed

for some tentative, unplanned exploration of the effect of medication on the ADHD child's reading comprehension. This exploration showed significant differences between group test performance. It was found that ADHD children off-medication scored significantly lower across the reading comprehension measures than did either the ADHD children on-medication or the Comparison children. However, the difference between ADHD children on-medication and the Comparison children was not significant.

This finding suggests the possibility that medication improves the reading comprehension performance of children with ADHD. While ADHD children on-medication still had lower mean reading comprehension test scores than did the Comparison children, the difference between mean scores was not significant. Obviously, however, it needs to be acknowledged that this medication status variable was not one that the study had planned to examine. As such any conclusions regarding the effect of medication on the ADHD child's reading comprehension abilities are highly speculative.

As with any research project, the current study not only answered questions but raised new issues for future research. Suggestions for future research included the following:

1. After carefully constructing a sample including the different ADHD subtypes, and matched peers without this disorder, explore group differences on rapid number naming tests. Are rapid number naming difficulties specific to children with inattentive as opposed to hyperactive symptoms?

2. Examine the listening comprehension abilities of children with ADHD. Is this the cause of the ADHD group's comprehension difficulties?

3. Examine the effectiveness of different reading comprehension teaching strategies in improving the reading comprehension skills of children with ADHD. How can teachers better ensure that students with ADHD understand what they read?

4. Investigate the performance of ADHD children on other academic skills judged to require effortful processing. Do children with ADHD have relative difficulty with essay writing and math reasoning when compared to peers without ADHD (who have similar spelling and calculation skills)?

5. Examine the difference in performance of ADHD children on main idea identification tests (which require attention to the important points in a passage) versus multiple choice tests (which require greater attention to the details in a passage). Do ADHD children have relative difficulty identifying main ideas to the exclusion of less important details?

6. Explore the effect of medication on the reading comprehension of ADHD children. Does medication positively influence the reading comprehension of children with ADHD?

7. Continue to investigate the hypothesized interaction between ADHD and type of reading comprehension task. Perhaps it is possible to use microprocessing tests (such as the Passage Comprehension subtest from the *Woodcock-Johnson Tests of Achievement)* that do not require the time on-task found in the current research. Additionally, it would be essential to include as participants carefully identified subtypes of ADHD and to examine how the different subtypes differ from carefully matched peers without this disorder.

8. Quantify learned helplessness and ADHD symptom severity and then determine which of these variables contributes the most to reading comprehension test score variance.

While each of these questions would individually be worthwhile research projects, the author of this report has developed a single design that would assess each of these future research

ideas. This design is summarized in Figure 1. As can be seen it would first involve obtaining a sample of ADHD children who fall into each of the three types of this disorder. Next, using the same initial and secondary participant selection procedures employed in the current study, ADHD group participants would be carefully matched with peers who do not have this disorder. As each ADHD and comparison participant is identified, each would be given a secondary participant screening battery similar to that used in the current study. This battery would include a rapid number naming tests as well as a measure of listening comprehension skill.

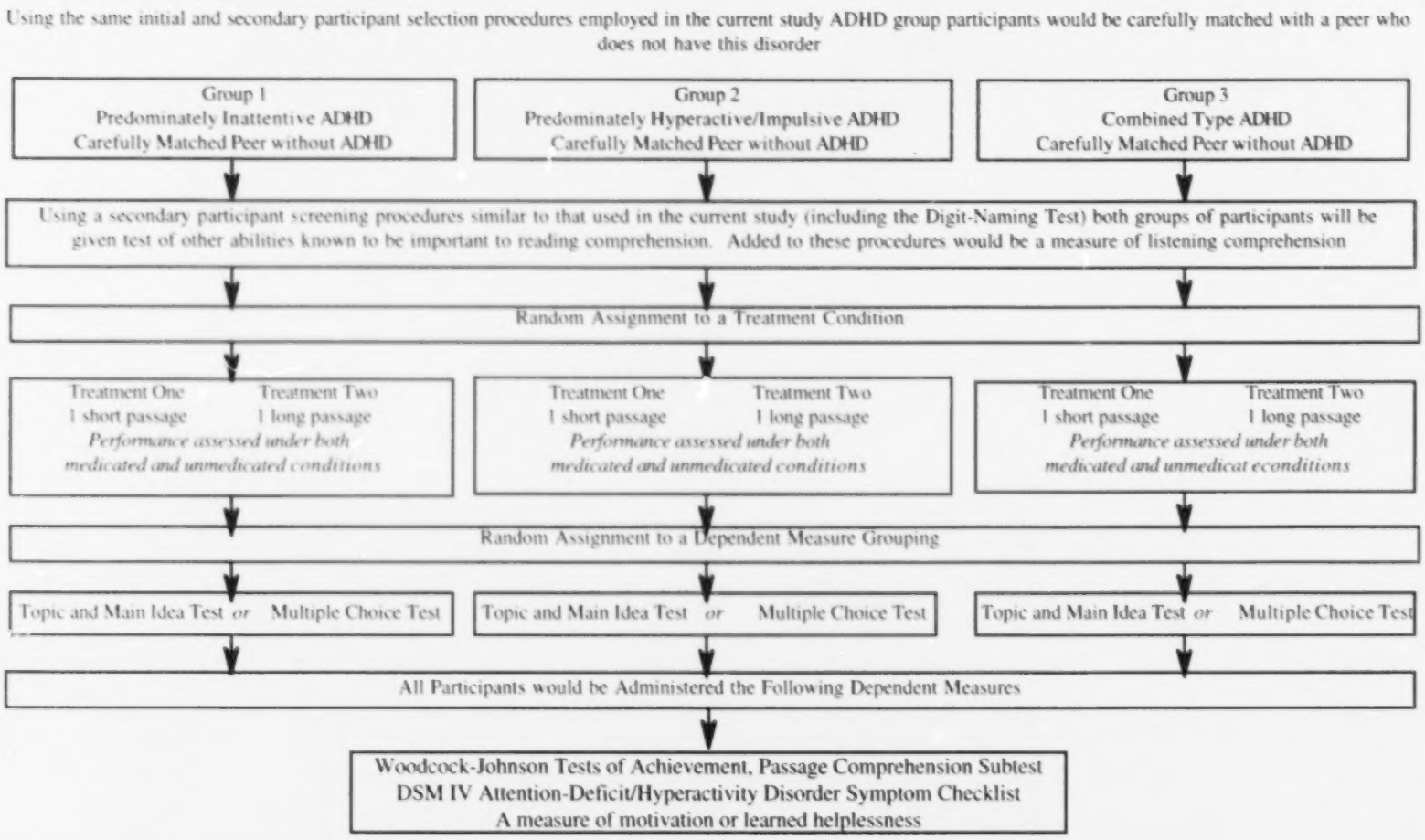
Next, participants in each of the three ADHD groups and their carefully matched comparison group peer would be randomly assigned to one of two treatment conditions. Treatment one would require participants to read one short passage. Treatment two would require participants to read one long passage. Passages would be from the same naturally occurring textbook, would have similar word frequencies, vocabularies, and readability scores. This treatment would be repeated for all participants. In counter balanced order they would be asked to read passages on a day where they had taken stimulant medication, and on a day that they had not taken medication. This aspect of the design would allow for further exploration of the effect of sustained attention requirements on reading comprehension abilities of ADHD subtypes, as well as for an exploration of the effects of medication on the reading comprehension abilities of ADHD children.

Next, all ADHD participants and their carefully matched comparison group peers would be randomly assigned to one of two dependent measure groupings. The first grouping would be given a topic and main idea identification test (similar to that used in the current research). The second would be given a multiple choice test. This procedure would allow for examination of group differences on a task that requires focused attention (topic and main idea identification) versus as task that requires attention to details regardless of importance (multiple choice test).

Finally, all participants would be given the Woodcock-Johnson Tests of Achievement, Passage Comprehension subtest, and a measure of motivation or learned helplessness. Also, a DSM IV ADHD symptom checklist would be obtained form the parents of all participants. The Passage Comprehension subtest would be used to assess microprocessing. As the Passage Comprehension subtest would not require the degree of sustained attention as the measure used in the current study, it is hoped that this subtest would provide a more valid estimate of microprocessing. The symptom check list would be used to assess symptom severity. In combination with a measure of motivation, it could be used to determine how much variance in reading comprehension scores is accounted for by symptom severity and motivation.

Figure 1

Summary of a Research Proposal Designed to Address Questions Raised by the Current Research [1]


Using the same initial and secondary participant selection procedures employed in the current study ADHD group participants would be carefully matched with a peer who does not have this disorder
Group 1
Predominately Inattentive ADHD
Carefully Matched Peer without ADHD
Group 2
Predominately Hyperactive/Impulsive ADHD
Carefully Matched Peer without ADHD
Group 3
Combined Type ADHD
Carefully Matched Peer without ADHD
Using a secondary participant screening procedures similar to that used in the current study (including the Digit-Naming Test) both groups of participants will be given test of other abilities known to be important to reading comprehension. Added to these procedures would be a measure of listening comprehension
Random Assignment to a Treatment Condition
Treatment One
1 short passage
Treatment Two
1 long passage
Performance assessed under both medicated and unmedicated conditions
Treatment One
1 short passage
Treatment Two
1 long passage
Performance assessed under both medicated and unmedicated conditions
Treatment One
1 short passage
Treatment Two
1 long passage
Performance assessed under both medicated and unmedicat econditions
Random Assignment to a Dependent Measure Grouping
Topic and Main Idea Test or Multiple Choice Test
Topic and Main Idea Test or Multiple Choice Test
Topic and Main Idea Test or Multiple Choice Test
All Participants would be Administered the Following Dependent Measures
Woodcock-Johnson Tests of Achievement, Passage Comprehension Subtest
DSM IV Attention-Deficit/Hyperactivity Disorder Symptom Checklist
A measure of motivation or learned helplessness

[1]From Brock, S. E. (1995). The reading comprehension abilities of children with Attention-Defici/Hyperactivity Disorder. Unpublished doctoral dissertation. University of California, Davis.

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